

7.0 Reclaimed Water Systems

The purpose of this section is to provide guidance on how to prepare an engineering report/environmental information document (ER/EID) for a reclaimed water

Reclaimed water – Water that has been used, conveyed to a WWTP, and treated to reclaimed water standards.

project. From an applicability point of view, the Scope rule ([15A NCAC 2T .0901](#)) states that reclaimed water systems involve “...the utilization of tertiary treated wastewater effluent, meeting the standards in Rule .0906 of this Section, used in a beneficial manner and for the purpose of conservation of the State’s water resources by reducing the use of a water resource (potable water, surface water, groundwater).” Examples of these projects include:

- A Local Government Unit (LGU) whose wastewater treatment plant (WWTP) already has a reclaimed water permit and wants to extend its distribution system to newly constructed residential development for irrigation purposes.
- An LGU whose WWTP needs some type of process upgrade(s) (e.g. disinfection) to meet reclaimed water effluent standards (15A NCAC 02T .0906), and wants to construct a distribution system to serve an industrial complex.

Only reclaimed water projects intended for conjunctive use (see [15A NCAC 2T .0902](#)) will be considered under this section, and then for projects involving only some process modification in the WWTP to meet reclaimed water standards. Reclaimed water systems proposed as part of new construction, a larger upgrade or expansion project, or for a non-conjunctive use must follow the guidance under Section 3.0. The ER/EID requirements provided here for the reclaimed water systems, including the process modification in the WWTP to meet reclaimed water standards and reclaimed water distribution system infrastructure, are included in Section 3.0 by reference.

Some projects may qualify for Minor ERs/EIDs. (See Section 1.4.1 for the details of when these are allowed.) For Minor ERs/EIDs, complete the tables provided in Appendix J for the requirements in each section. For calculations discussed throughout this section, worksheets provided in the workbook titled Reclaimed Water Systems must be utilized and the information reported in the appropriate tables. This workbook is available in the Toolbox.

For Major ERs/EIDs, the guidance may allow alternative data, methodologies, and the way material is presented; *however, the format must always be followed*. Each subsection will advise if these are allowable.

- Alternative data sets other than those specified in this section *may be* proposed in certain subsections. *In all cases, alternative data sets must be identified, discussed, justified and compared with the corresponding data set specified in the guidance*. An acceptable rationale for the preferred alternative data set to the one specified in the guidance *must be provided* if it is to be approved.
- Alternative methodologies must be specified and discussed, and *the findings* compared with the findings *based on the corresponding methodologies in the guidance*. *All alternative methodologies must include supporting data, calculations, assumptions and documentation* so that results can be replicated.

- If material is presented in alternative manner, the *required discussion* must be in the body of the ER/EID. Supporting information (e.g., maps, calculations, supporting data, etc.) may be included in an appendix rather than the body of the ER/EID. A tabular display of the data is encouraged where practicable. Use of the worksheets found in the Wastewater Treatment workbook is encouraged.

As stated in Section 2, the report must follow the prescribed format in the guidance. ERs/EIDs for projects under this section must follow the format below:

- Upfront Information
- 1.0. Executive Summary
- 2.0. Current Situation
 - 2.1. Project Area Description
 - 2.2. WWTP Condition
 - 2.3. Current Population
 - 2.4. Current Flow
 - 2.5. Reclaimed Water Demand
- 3.0. Future Situation
 - 3.1. Future Reclaimed Water Demand
 - 3.2. Future Population
 - 4.3. Flow Projections
- 4.0. Purpose and Need
- 5.0. Alternatives Analysis
 - 5.1. Alternatives Description
 - 5.2. Present Worth Analysis
 - 5.3. Alternatives Analysis Summary
 - 5.4. Proposed Project Description
- 6.0. Environmental Information Document
- 7.0. Financial Analysis
- 8.0. Public Participation

7.1 Upfront Information

Prepare the upfront information (e.g., Table of Contents, Appendices) in accordance with Section 2.2.1.

7.2 Executive Summary

Prepare the Executive Summary in accordance with Section 2.2.2.

7.3 Current Situation

Part of determining the need for the project requires defining the current conditions of the facilities where the project will occur. Additionally, defining the current situation helps the review engineer ascertain the condition of the facilities where the project will occur. The following sections are discussed: (1) description of the project area, (2) current population; (3) WWTP flows; (4) reclaimed water situation; and (5) WWTP condition.

7.3.1 *Project Area Description*

Part of ascertaining the current situation for reclaimed water projects includes describing the area where the project will occur. Complete the requirements as discussed below.

Requirements

Discuss where the reclaimed water project will occur. If the reclaimed water project only includes work complete at the WWTP, then state as such. Describe the service area in general terms. Discuss the types of users in the service area (e.g., residential, commercial, significant industrial users). If there are any potential or existing reclaimed water customers within the service area, provide a listing and the type of customer (e.g., residential area, plant nursery). In a figure, show the WWTP where the project will occur and outline the service area that contributes wastewater to the WWTP. Show the location of any potential or existing reclaimed water customers. Include on the figure the basemapping as required in Section 2.1.5.

If the existing WWTP: 1) is already permitted to produce wastewater meeting reclaimed water effluent standards; 2) has had no NOV's or SOC's at the WWTP which involved a failure to meet the reclaimed water quality standards; and 3) proposes no upgrade of the existing equipment and/or processes over the life of the proposed project, then the information in the following paragraphs may be omitted.

Minor ERs/EIDs

- Complete Table 2.1.1 in Appendix J and include in the body of the ER/EID.
- Provide a figure that shows the information described in this section. List the figure reference in the table.
- Provide any supporting information in an appendix of the ER/EID and list the appendix reference in the table.

Table E.9.1 in Appendix E shows how this table would be completed.

7.3.2 *WWTP Condition*

There may be situations where it is important to assess the WWTP condition. The situations where this will be the case are if the existing WWTP:

- Does not have a permit to produce wastewater meeting reclaimed water standards.
- Has had notices of violation (NOVs) or special orders, including special orders of compliance (SOCs) which involved a failure to meet reclaimed water standards
- No upgrade to WWTP equipment is needed to produce reclaimed water.

If none of these conditions are met, then check the “no” box on Table 2.2.1 and complete Section 7.3.2.1 only.

7.3.2.1 *General WWTP Condition*

As part of determining the need for the project, it is important to gain an understanding of the WWTP condition. An overall assessment of the condition of the WWTP provides an overview of the basics of the WWTP and its capabilities of handling reclaimed water as well as the groundwork for a more detailed assessment of the specific components of the WWTP. Complete the following sections related to the WWTP.

Requirements

Describe the general condition of the WWTP. This description should be a general description of (1) the basic process; (2) whether the WWTP is in good working order, and (3) the trend in flows.

Provide the average daily flow in million gallons per day (MGD) for the past four years and its current flow. DMRs must be provided in an appendix of the ER/EID.

Include in this discussion any Notices of Violation (NOV) that the WWTP might have incurred over the past five years. If there are any special orders such as a SOC, discuss the pertinent information as to why the special order was put into place, the final completion deadline, and any intermediate deadlines.

Additionally, include diagrams or schematics of both liquid and sludge treatment trains, noting the overall direction of flow as well as recycle loops. Also, provide a plan (or plans) which show(s) and label(s) the physical location of each unit operation and process or (system of operations and processes) in sufficient detail to show (and label) major yard piping as well as recirculation piping and pumping.

Minor ERs/EIDs

- For the current condition of the WWTP, complete Table 2.2.1 in Appendix J and include in the body of the ER/EID.
- If NOVs or special orders are listed, provide full copies of these NOVs or special orders in an appendix of the ER/EID. Reference the appendix in the table.
- Provide both a conceptual schematic and a plan diagram in the ER/EID. Supply the appropriate reference for these figures in the table.
- Include DMR records for the past four years in an appendix of the ER/EID. Reference the appendix in the table.

Table E.9.2 in Appendix E shows how this table would be completed.

Major ERs/EIDs

Describe the WWTP condition as discussed in this section. Include DMRs in an appendix of the ER/EID as well as any NOVs or special orders that the WWTP might have incurred.

7.3.2.2 *Condition of Specific WWTP Equipment*

To further understand the condition of the WWTP and its ability to produce wastewater to reclaimed water standards, each piece of equipment should be assessed if any of the conditions described in the introductory text of Section 7.3.2 are met.

Requirements

Provide information regarding the size, age, condition, and other pertinent information that would provide a solid assessment of each portion of the wastewater treatment processes. If possible, provide photos of each piece of equipment. The equipment should include but is not limited to the following:

- Influent pump station
- Bar screen and grit removal
- Aeration equipment
- Clarifiers
- Disinfection
- Post-aeration
- Sludge treatment
- Sludge disposal

Condition should be assessed as follows:

- **Good.** The equipment shows little signs of wear and functions in an efficient manner with only routine maintenance. It shows minimal signs of corrosion and deterioration.
- **Fair.** The equipment shows some signs of wear and fails periodically. Some repair outside of routine maintenance is required to keep the equipment functioning. Minor upgrades provide reliability.
- **Poor.** The equipment shows signs of wear and fails on a regular basis. Repairs outside of routine maintenance occur frequently. The equipment shows excessive signs of corrosion that limits functionality. Upgrades are needed to provide reliability.

Use a sub-section (Major ER/EID) or table (Minor ER/EID) per each piece of equipment to discuss the information above and any additional information that provides an accurate description of the equipment. On a diagram, show where this piece of equipment is located within the WWTP site. Also, where possible, include photographs and reference these photographs in the description. Provide any supporting information in an appendix to the ER/EID and supply the appropriate reference in the body of the ER/EID. Additional information should be provided in an appendix of the ER.

Minor ERs/EIDs

- Using Table 2.2.2 in Appendix J as the standard, complete a table for each piece of equipment (e.g., 2.2.2a, 2.2.2b). Print these tables and include them in the body of the ER/EID.
- Provide any photos taken of equipment in an appendix to the ER/EID. List the appropriate reference in the table.
- Provide any supporting information in an appendix to the ER/EID. List the appropriate reference in the table.

7.3.3 Current Population

7.3.3.1 No Residential Users

If a specific reclaimed water user (e.g., an industry) has a letter of intent (LOI) on file, and there is no current residential reclaimed water use and there are no plans to have any residential reclaimed water use over the 20-year project life, then no analysis of the service area population is required. If this is the case, state as such. Additionally, the financial analysis discussed in Section 2.2.8 will be based on the WWTP's current flow, and the revenue generated will be based on the flow to that specific user rather than current population.

7.3.3.2 Residential Users

If there is currently residential reclaimed water use and/or there are requirements (e.g., from the local building code) to implement a residential reclaimed water use, an analysis of the population served by the WWTP is required. Since current population usually provides the basis for future population growth, population and the corresponding flow projections may provide either all or part of the basis for the financial analysis as discussed in Section 2.2.8. For instance, an LGU passes a local building ordinance requiring new residential developments to have irrigation piping installed for lawn irrigation and/or garden watering using reclaimed water. Projected residential reclaimed water use could be estimated from population and wastewater flow projections and so provide the incentive for constructing or adding to an existing reclaimed water system.

Additionally, current population provides the basis for future population and may supply part or all of the need for the project. Follow the steps in this section to determine current population for the LGU and the WWTP service area.

Requirements

1. Provide the total population for the LGU.

Provide the total population for the LGU for 2010 using [U.S. Census data](#). 2010 estimates only should be used. Provide the population density per square mile.

2. Provide the number of persons per square mile based on [U.S. Census](#) data.

Select the LGU in the search box and locate the “Geography Quick Facts” at the bottom to find the number of persons per square mile.

From the inputs determined per the above instructions, the persons per dwelling unit in the LGU, current population in the service area and current population in the service area will be calculated in Table 1.

3. Provide the size of the LGU.

Using the U.S. Census website, find the size of the LGU, which is located under “Geography Quick Facts” at the bottom of the webpage.

4. Provide the size of the WWTP service area.

Using GIS or other appropriate mapping method, estimate the square mileage of the WWTP service area. Note that service area size may differ from the size of the LGU.

WWTP Service Area – The area of the LGU served by the WWTP.

Sewershed Service Area – The area of the WWTP service area that contains the project. Note that for major sewer interceptors, this may be the entire WWTP service area.

Minor ERs/EIDs

- Complete Table 2.3.1 in the Reclaimed Water workbook found in the Toolbox. Use the pulldown menu to select “Yes” or no regarding specific users. If “Yes”, then only this table is needed. Print this table and place it in the body of the ER/EID.
- Provide supporting information from the U.S. Census website in an appendix of the ER/EID. Reference the appropriate appendix in the table.

Table E.9.3 in Appendix E shows how this table would be completed.

Major ERs/EIDs

Alternative methodologies may be used. If an alternative methodology is used, then it must be explained in the body of ER/EID, and the results must be presented. All backup data, methodologies used, assumptions made, and calculations must be provided in an appendix of the ER/EID.

7.3.4 Current Flow

Part of describing the current condition of the WWTP where a reclaimed water project will occur is characterizing the flow coming into the WWTP from the service area. Flow coming into the WWTP must be determined by estimation. This section of the guidance describes the methodologies used.

Requirements

1. Calculate residential and commercial flow in the sewershed.

Determine residential flow in the service area by determining water usage based on water billing records from residential connections *within the service area* and calculating a 10 percent consumptive loss. Then, determine water usage based on water billing records from commercial connections *within the service area* and calculate a 10 percent consumptive loss. If water billing records are ambiguous in showing the amount of water used in the calculations for current flow estimations, then provide the calculations in an appendix of the ER/EID.

Include copies of water billing records in an appendix of the ER/EID. Highlight the data used for current flow estimation. If the documentation is too large for hard copies, a CD containing the data may be submitted instead.

1. Calculate industrial flow.

Determine industrial flow *from within the service area* based on dual metering. Dual metering for industries is required because sometimes, industries may obtain their water supply from other sources than an LGU.

Dual Metering – Metering at an industry that monitors both water coming in and wastewater going out.

Include hard copies of industrial flow metering in an appendix of the ER/EID.

3. Include flow commitments.

Part of the current wastewater flow for a service area includes residential, commercial, and industrial flows that have been officially committed. For example, within a sewershed, a developer may be planning a 1,200-unit residential development that also has 12 commercial parcels.

Because flow commitments are counted as current flow, they may not be included in future flow projections.

This flow would be considered to be committed if the developer has sent documentation to the LGU that has been approved by the LGU confirming the number of residential and commercial units and when the development will be constructed.

Include these flows as part of the current flow calculation *only if these committed flows are within the service area of the WWTP*. Include correspondence that shows the commitments for each individual development in an appendix of the ER/EID.

4. Calculate Inflow/Infiltration

In many instances, a collection system may be experiencing inflow/infiltration (I/I) issues that must be accounted for in current flow estimations at the WWTP. Inflow/infiltration may be estimated using either WWTP flow information only or both WWTP and water usage records. Equation 7.1 shows the I/I estimation using WWTP information only, and Equation 7.2 shows I/I estimation using both WWTP and water usage records. If the sewershed where the project will occur is a percentage of the WWTP's overall sewershed, then multiply the percentage of land area covered by the sewershed by the overall I/I estimate.

$$I/I = Q_{WWTP-ADF} - Q_{WWTP-MinADF}$$

I/I= Infiltration/Inflow
 $Q_{WWTP-ADF}$ = Average of the average monthly flow over the most recent four-year period of record at the WWTP
 $Q_{WWTP-MinADF}$ = Average of the minimum monthly flows over the most recent four years of record at the WWTP

Equation 7.1. Inflow/Infiltration Estimation Using WWTP Information Only

$$I/I = Q_{WWTP-ADF} - (WU_{Total} - CL)$$

I/I= Inflow/Infiltration
 $Q_{WWTP-ADF}$ = Average of the average monthly flows over the most recent four-year period of record at the WWTP
 WU_{Total} = Average water use for residential, commercial, and industrial users over the same recent four-year period used for the WWTP.
 CL= Consumptive loss of 10 percent

Equation 7.2. Inflow/Infiltration Estimation Using WWTP and Water Usage Records

3. Calculate current flow.

Add the calculations from Steps 1 through together to determine total current flow to the WWTP to be constructed, expanded, and/or modified as shown in Equation 7.3.

$$ADF_{Current} = [(ADF(Water)_{Residential} - (ADF(Water)_{Residential} \times 10\%)] + [ADF(Water)_{Commercial} - (ADF(Water)_{Commercial} \times 10\%)] + ADF_{Industrial} + FC + I/I]$$

$ADF_{Current}$ = Current average daily wastewater flow at WWTP
 $ADF(Water)_{Residential}$ = Current average daily water flow for residential customers.
 $ADF(Water)_{Commercial}$ = Current average daily water flow for commercial customers
 $ADF_{Industrial}$ = Average daily industrial flow with dual metering
 FC= Flow commitments
 I/I= Inflow/Infiltration

Equation 7.3. Current Flow Estimate Calculation

Minor ERs/EIDs

- Use Table 2.4.1 in the Reclaimed Water workbook found in the Toolbox. Print this table and place it in the body of the ER/EID.
- Provide supporting information in an appendix of the ER/EID and supply the appropriate reference in the table.
- Provide any letters related to flow commitments in an appendix of the ER/EID.

Table E.9.4 in Appendix E shows an example of how this table would be completed.

Major ERs/EIDs

Alternative methodologies may be used. If an alternative methodology is used, then it must be explained in the body of ER/EID, and the results must be presented. All backup data, methodologies used, assumptions made, and calculations must be provided in an appendix of the ER/EID.

7.3.5 Reclaimed Water Demand

As part of the current situation, it is important to define both the issues surrounding the need for a reclaimed water system as well as the current demand for reclaimed water. Complete the requirements of each section below.

7.3.5.1 History of Need for Reclaimed Water

As part of ascertaining the current situation, it is important to detail the history that led to the decision to either implement or expand a reclaimed water system. Such situations that would require a LGU to take action could be as follows:

- To reduce demand for potable water by substituting reclaimed water for uses where potable water is currently being used.
- To reduce costs and potable water usage by industry where large volumes of potable water are used for processes where reclaimed water could be used.
- To help WWTPs meet nutrient limits where further treatment may not be possible or financially feasible.

Requirements

Provide a narrative history that elaborates on the issues that led to a decision to implement a reclaimed water program or to expand the existing one. If using reclaimed water to reduce potable water demand, approximate the current potable water usage utilizing the information discussed below in Section 7.3.5.2. Then define the ways in which reclaimed water could be used to reduce the demand and show both the amount of potable water usage reduction and the percentage of reduction that would occur if the project were implemented. Provide supporting data regarding specific user reclaimed water demand in an appendix of the ER/EID.

If using a reclaimed water system to meet nutrient limits, describe what steps had been taken to bring the WWTP to the current treatment limits. Then discuss how the reclaimed water project would help the WWTP meet reduced nutrient limits. Refer back to the information provided in Section 7.3.2 as needed. Provide any supporting information in an appendix to the ER/EID.

Minor ERs/EIDs

- Complete Table 2.5.1 in Appendix J and include it in the body of the ER/EID.
- Include all supporting information in an appendix to the ER/EID. List the appendix reference in the table.

Table E.9.5 in Appendix E shows an example of how this table would be completed.

7.3.5.2 Current Reclaimed Water Demand

Customer demand for reclaimed water can vary from LGU to LGU. One LGU may, by changes in the local building code, insure that reclaimed water infrastructure is part of new residential development, with an easily identifiable customer base. Another LGU may have an existing industry that wants to utilize reclaimed water as process water.

Still another LGU may be committed to a reclaimed water program but, as yet, has an insufficient number of customers to cover debt repayment for the entire loan. In this case, the LGU has committed to underwrite the program until the customer base can support repayment of the loan.

Requirements

Break out current reclaimed water demand by user (e.g., industry, residential development) and include information regarding current average monthly total potable water usage, current reclaimed water use or demand, and percentage reduction in reclaimed water usage. Show on a map where all current reclaimed water demand is located. Include on the map the location of the WWTP from where the reclaimed water will come. List the figure reference in the discussion. If the LGU has implemented a building code that requires the usage of reclaimed water, then provide a copy of the ordinances in an appendix to the ER/EID and list the reference in the body of the ER/EID. Note that if reclaimed water will be utilized for irrigation in residential areas, then the requisite irrigation meters and piping must already be installed.

If an industry is utilizing reclaimed water, then there must be a letter of agreement discussing the beginning and end date of usage and the average amount of reclaimed water that will be utilized. Discuss this agreement and provide a copy in an appendix to the ER/EID.

Minor ERs/EIDs

- Complete Table 2.5.2 in the Reclaimed Water workbook and include it in the body of the ER/EID.
- Provide a figure showing the location of current reclaimed water demand. List a reference to the figure in the table.
- Provide any supporting information in an appendix to the ER/EID and list the appropriate appendix level in the table.

Table E.9.6 in Appendix E provides an example of how this table would be completed.

7.4 Future Situation

After characterizing the current situation it is important to analyze the future situation. In addition to establishing the need for the project, it will help determine the size of the reclaimed water system and whether any additional treatment technology beyond what is currently planned is needed.

If the reclaimed water system will be implemented or expanded to accommodate specific users (e.g., industrial users, residential development), then no analysis of future population or flow projections is needed. Complete only the requirements in Section 7.4.1.

However, if reclaimed water demand has the potential to outstrip the wastewater supply, then completed Sections 7.2.2 and 7.4.3 in addition to Section 7.4.1.

A LGU may be committed to a reclaimed water program but, as yet, has an insufficient number of customers to cover debt repayment for the entire loan. In this case, the LGU has committed to underwrite the program until the customer base can support repayment of the loan.

In order to move forward with a reclaimed water project, the LGU must be able to make or supplement the first year's annual repayment of loan and interest as well as the first year's operations and maintenance costs.

7.4.1 Future Reclaimed Water Demand

Determining future reclaimed water demands requires not only an analysis of who the future users might be but also an understanding of whether or not the WWTP will have the wastewater capacity to provide sufficient reclaimed water to meet the demands. Complete the requirements in the following sections for future reclaimed water demand.

7.4.1.1 Determination of Future User Base

Requirements

Future reclaimed water demands should be based on the type of expected reclaimed water users (e.g., residential irrigation, industrial use, golf course irrigation) over the course of a 20-year period.

If reclaimed water use will come from newly constructed residential development as required by local ordinances, then discuss how the number of connections was determined such as LGU ordinances that require connection to reclaimed water systems upon availability. The discussion should include the basis for demand (e.g., irrigation flows per connection). Show the location of these customers on a map.

Most other situations (e.g., industrial users, golf courses, etc.) must provide a Letter of Intent (LOI) which details the specifics of how much reclaimed water will be used and over what period of time, the intended use(s) of the reclaimed water, what percentage of the reclaimed water used will be returned to the sewerage system, etc.

For each user, list out the (1) user name, (2) the type of user (e.g., industrial, residential, commercial, municipal, institutional), (3) usage type (e.g., seasonal, constant), (4) if seasonal, the number of months utilized; (5) the unit (e.g., per residence, per facility), (6) the quantity of units, and (7) the average daily usage per unit for Year 1, Year 5, Year 10, Year 15, and Year 20.

For seasonal users, it is important to consider the average daily flows that occur during that period of time when the user would be demanding reclaimed water to create a “worst-case” scenario. Calculate the average daily use for that particular season. For example, the LGU may assume that residential users may irrigate their yards over a six-month period during the spring and summer and not the rest of the year. If that is the case, calculate the average daily usage to be as if they watered every day over that six-month period. For each seasonal user, provide supporting information in an appendix to the ER/EID that shows the assumptions made. In the appendices of the ER/EID, provide a LOI for each reclaimed water user (other than residential customers) utilizing the system. Each letter must provide the following:

- The owner of the potential user
- A description of how the reclaimed water will be used, and what percentage of that use will be returned to the sewerage system
- The amount of reclaimed water to be used per month, and a statement of whether the reclaimed water usage will vary over time
- The year in which the project will be expected to come on line, and the period (years) over which the reclaimed water usage will continue
- A statement of intent

Appendix K provides an example of a reclaimed water LOI.

Minor ERs/EID

- Complete Table 3.1.1 in the Reclaimed Water workbook. Print this table and include it in the body of the ER/EID.
- Show the location of future users on a map. List the figure reference in the table.
- Provide LOIs for all future reclaimed water customers in an appendix to the ER/EID. List the appendix reference in the table.

Table E.9.7 in Appendix E shows how the table would be completed.

7.4.1.2 Determination of Reclaimed Water Capacity

Requirements

Once the future demand has been quantified, it is important to determine whether the WWTP producing the reclaimed water would provide enough of a wastewater stream to provide the reclaimed water needed to supply users. To do this, list the average daily flow (ADF) for the current year, Year 1, Year 5, Year 10, Year 15, and Year 20. Compare the WWTP ADF to the average daily usage for reclaimed water for each year. Supply supporting information for future flows, including population projections, the flow projection methodology used, and sample calculations in an appendix to the ER/EID.

If the reclaimed water demand is higher than the ADF for any of these years, then complete a population projection and flow projection in accordance with Section 7.4.2 and 7.4.3 below to determine the year in which reclaimed water demand would exceed flow. Discuss plans to account for this situation, such as limiting reclaimed water users, WWTP expansion, or an aggressive I/I campaign to gain additional capacity.

Minor ERs/EIDs

- Complete Table 3.1.2 found in the Reclaimed Water workbook located in the Toolbox. Print this table and include it in the body of the ER/EID.
- Provide supporting information in an appendix of the ER/EID. List the appendix reference in the table.

Table E.9.8 in Appendix E shows an example of how this table would be completed.

7.4.2 Future Population

Follow the steps below to determine population projections. If the service area spans multiple counties, a table for each county and then prepare a table that summarize the projections from all counties.

Requirements

1. Determine current population

Complete Section 7.3.3 to calculate the current population for the area.

2. Provide the Current LGU population and service area population.

Use the current LGU population and service area population. If using the Future Population table provided in the Wastewater Treatment workbook found in the Toolbox, then the data will appear in the cell.

3. Determine the 2010 county population.

For Year 1 (year 2010), use [U.S. Census QuickFacts](#) page and select the county for the total county population. Use only 2010 estimates.

4. Calculate percentage of population.

The population projections will be based on two parameters, the percentage of the county population that is located in the LGU and the percentage of the LGU that is located in the service area. To provide the basis for this calculation, divide the 2010 LGU population by the 2010 county population. Then divide the service area estimated population by the 2010 LGU population.

5. Determine population estimates using State Data Center (SDC) data.

Determine the year in which construction of the project will begin. This is the implementation year. Then, using information from the [State Data Center](#), determine the population projections for the next 20 years. Select “Annual County Populations”. If using the Wastewater Treatment workbook found in the Toolbox, enter this information into the Future Population worksheet. There may be cases where the SDC data might not extend the full 20 years. If this is the case, then determine the difference between the last two years of the estimate. Then add that difference for each needed year.

6. Calculate the future LGU and service area populations.

Use the percentage of LGU in the county and the percentage of the LGU in the service area to determine future service area population. If using the Wastewater Treatment workbook found in the Toolbox, this information will be automatically calculated.

If the service area spans multiple counties, then complete separate tables for each county. Complete a summary table showing the projected population for each county and sum the total future population for the counties and LGU(s) involved. Most importantly, show the total future service area population.

7. Provide alternative population projections from other sources (if proposed).

Requirements

Other sources of data such as municipal population estimates, comprehensive plans, or projections based on connections may be used to determine future population so long as the same window used for the SDC populations above is used. To calculate the service area number, multiply the LGU future population by the percentage of the service area in the LGU. If multiple data sources are used, show the results of each source in the table as discussed below and provide supporting information in the appendices of the ER/EID. Additionally, justify the use of this data as an additional data set to be used along with the SDC data. If no alternate population data set is proposed in lieu of the SDC, then skip this step and move to Section 3.4.2.

It is strongly recommended that as the ER/EID is prepared, the Consultant and Owner meet with IFS to discuss population projections before proceeding to the next steps, which will help determine the alternatives to be analyzed.

Minor ERs/EIDs

- Use Table 3.3.1 in the Wastewater workbook found in the Toolbox. Select the appropriate current population methodology from the pulldown menu and enter the required information. Print this page and place it in the body of the ER/EID.
- Provide supporting information verifying the population projections for other population methodologies used.

Major ERs/EIDs

Alternative methodologies may be used. If an alternative methodology is used, then it must be explained in the body of ER/EID, and the results must be presented. All backup data, methodologies used, assumptions made, and calculations must be provided in an appendix of the ER/EID.

7.4.3 Flow Projections

Determining future flow is critical to ensuring that the WWTP is properly sized to accommodate future flows. Since population projections determine flows, ensure that the population projection was completed as discussed in Section 3.4.1. The following sections describe how to determine average daily flows.

Requirements

Current flows are based on the methodology used to estimate flows across large service areas. Utilize Equation 3.3 to calculate future flows. If an alternative population and flow projection was utilized as the population and flows used in the alternatives analysis, provide a justification as to why this was used over the flow projection developed based on the methodologies described in this guidance.

$$Q_{Design} = (Q_{Current} + Q_{Res}(Pop_{Year} - Pop_{Cur}) + Q_{Com}(Pop_{Year} - Pop_{Cur}) + Q_{IR}[Q_{Current} + (Q_{Res}[Pop_{Year} - Pop_{Cur}] + (Q_{Com}[Pop_{Year} - Pop_{Cur}]))])$$

- Q_{Design}= Design Flow for Implementation Year plus 20 years
- Q_{Current}= Current average daily flow for WWTP (Section 3.3.3)
- Q_{Res}= Design Residential flow (70 gpd/capita)
- Q_{Com}= Design Commercial Flow (15 gpd/capita)
- Q_{IR}= Industrial Reserve (10%)
- Pop_{Year}= Population for year of projected flow
- Pop_{Cur}= Population for current year

Equation 7.3. Flow Projection Calculation

Minor ERs/EIDs

- Complete Table 3.3.1 in the Wastewater Treatment workbook found in the Toolbox. The spreadsheet will complete the calculation. Print this table and include it in the body of the ER/EID.
- Provide any supporting information related to alternative flow projections in an appendix and list the appropriate reference in the table.

Major ERs/EIDs

Alternative methodologies may be used. If an alternative methodology is used, then it must be explained in the body of ER/EID, and the results must be presented. All backup data, methodologies used, assumptions made, and calculations must be provided in an appendix of the ER/EID.

7.5 Purpose and Need

Complete the Purpose and Need statement in accordance with Section 2.2.3.

7.6 Alternatives Analysis

7.6.1 Alternatives Description

The first part of the alternatives analysis summarized in Section 2.2.5 consists of describing the alternatives considered for the project. Describing the alternative provides the opportunity to consider the impacts and benefits related to each alternative under consideration and provides the groundwork related to the present worth analysis (see Section 2.2.4).

- No-Action Alternative
- Upgrade of WWTP to Reclaimed Water Standards (WWTP process modification)
- Alternative Distribution System Alignments (piping and storage)
- Preferred Alternative

Requirements

The details of what is needed for the description of the alternatives will be discussed in Sections 7.6.6.1 through 7.6.6.4 below.

Minor ERs/EIDs

- Each of the alternatives discussed in the sections below must be included by using Tables 5.1.1 through 5.1.7 in Appendix J, as needed, for each alternative.
- Each alternative description must include the following:
 - A description of each alternative as described in the sections below. Where appropriate, include figures and maps.
 - For feasible alternatives that consist of upgrading the WWTP, include preliminary design information for the proposed project, including preliminary design criteria for all proposed unit processes and operations, sufficient to evaluate the proposed project.
 - For feasible alternatives that consist of distribution systems, provide information about the distribution lines including pipe length, material, and diameter and storage requirements.
 - For feasible alternatives, the capital cost and present worth as derived from the present worth analysis.
 - For all alternatives, a discussion regarding why the alternative was accepted or rejected, including capital cost, present worth, and environmental impacts.
- Place the tables for each alternative in the body of the ER/EID with all supporting information in an appendix.

Major ERs/EIDs

For Major ERs/EIDs, include the information as discussed above in the requirements for Minor ERs/EIDs. However, the information may be presented in narrative form, or in some combination of narrative with tables. Supporting documentation must be included in an appendix to the ER/EID.

7.6.1.1 No-Action Alternative

For this alternative, discuss what would happen if the project were not built. In answering this question, describe the social, economic, and environmental impacts that would occur from not building the project. In the rationale, describe why this alternative was not chosen, including whether it was feasible to continue as discussed in the no-action scenario.

7.6.1.2 Upgrade of WWTP to Reclaimed Water Standards (WWTP process modification)

Under this alternative, how the WWTP could be upgraded to generate reclaimed water to meet reclaimed water standards. At least two different upgrade options must be considered. For each upgrade, provide a conceptual and actual flow diagram of how the alternative would look. Provide a rationale explaining why each alternative alone was accepted or rejected.

7.6.1.3 Alternative Distribution System Alignments (piping and storage)

As part of the project, the LGU may need to construct a reclaimed water distribution system to send reclaimed water to potential customers. It may be possible to utilize one of several different alignments to do so. Since each of these alignments can vary in terms of cost and environmental impact, consider each individual alignment as a separate alternative. Provide a figure showing these alignments and whether the size of the pipe and/or material varies throughout the alignment. Provide the rationale as to why each alternative alone was accepted or rejected.

7.6.1.4 Preferred Alternative

The project selected as the preferred alternative may be a combination of the above alternatives. Describe the preferred alternative by summarizing and referring back to any other alternative descriptions as necessary. Provide the rationale as to why this alternative is the preferred alternative.

7.6.2 Present Worth Analysis

Complete the present worth analysis in accordance with Section 2.2.4.

7.6.3 Alternatives Analysis Summary

Complete the alternatives analysis in accordance with Section 2.2.5.

7.6.4 *Proposed Project Description*

Prepare the proposed project description in accordance with Section 2.2.6.

7.7 Environmental Information Document

Complete the environmental information document in accordance with Section 12.

7.8 Financial Analysis

Complete the financial analysis in accordance with Section 2.2.8.

7.9 Public Participation

Complete the public participation section in accordance with Section 2.2.9.